

REMARKS

Claims 1-21 were examined and rejected. claim 10 has been previously canceled. Applicants amend the specification and claims 13, 15, 17, and 18, and submit that no new matter is added herein as the amendments are supported by the angle between the dashed line radiating from feature 191 and the surface of feature 100 as shown in Figure 1. Applicants respectfully request reconsideration of claims 1-9 and 11-21 in view of at least the following remarks.

I. Rejections Under 35 U.S.C. §112

The Patent Office rejects claims 15-21 under 35 U.S.C. §112, first paragraph because “an angle of less than 90 degrees” was not contained in Applicants’ specification as originally filed. Applicants amend claim 15 to change “an angle of less than 90 degrees” to “an angle of between 50 degrees and 60 degrees” and assert that claims 15/21 are proper and supported by the angle between the dashed line radiating from feature 191 and the surface of feature 100 as shown in Figure 1 of Applicants’ specification as originally filed. Hence, the Applicants respectfully request the Patent Office withdraw the rejection above.

The Patent Office rejects claims 12 and 17 (should be 13-17) under 35 U.S.C. §112, first paragraph because a program including instructions to “re-crystallize” a metal component was not contained in Applicants’ specification as originally filed. Applicants amend claims 13 and 17 to change “re-crystallize” to “crystallize”, and reserve the right to amend the claims back to “re-crystallize” and/or file a continuation application for similar claims including “re-crystallize”. Hence, the Applicants respectfully request the Patent Office withdraw the rejection above

II. Claims Rejected Under 35 U.S.C. § 103

The Patent Office rejects claims 1-21 under 35 U.S.C. § 103 as being unpatentable over U.S. Patent no. 5,026,664 to Hongo et al. (Hongo I) taken in view of U.S. Patent no 5,182,231 to Hongo et al. (Hongo II) and U.S. Patent no. 5,342,448 to Hamamura

(Hamamura). To render a claim obvious, all elements of the claim must be taught or suggested by at least one properly combined reference of the combination.

Applicants respectfully disagree with the rejection above and submit that independent claim 1, is patentable over the cited references for at least the reason that the cited references do not teach or suggest a system having a controller configured to control the introduction of a focused ion beam to form at least one metal layer over a substrate, and instructions for controlling a coherent electromagnetic radiation source applied to a top surface of the at least one layer to heat the at least one metal layer sufficiently to remove gallium from the layer, as required by claim 1.

The Patent Office cites Hongo I to teach controlling a coherent electromagnetic radiation source applied to a top surface of the at least one layer (See Hongo I, col. 2, line 56 through col. 3, line 40). Hongo I teaches opening a hole in an insulating film layer (passivation layer) of a semiconductor IC device, forming an auxiliary conduction film on only a conductor path by using a focusing ion beam, and condensing and directing, in an atmosphere containing a metal compound gas, a laser beam onto the auxiliary conduction film to thereby form an additional wiring conductor of metal on the auxiliary condition film are performed without exposure to an oxygen atmosphere layer (See Hongo I, col. 2, line 56-65). Here, the additional wiring conductor of metal is on the auxiliary condition film. Further on, Hongo I teaches a wiring conductor having low resistance can be formed by forming an additional wiring conductor of metal and then condensing and directing, in a non-oxidizing atmosphere, a laser beam onto the additional wiring conductor. Here, the laser beam is directed onto a surface of the additional wiring conductor formed by the laser beam, not onto a surface of the auxiliary condition film formed by the ion beam.

Consequently, the Patent Office has not cited and Applicants are unable to find any description or suggestion in Hongo I that accounts for introduction of a focused ion beam to form at least one metal layer over a substrate, and instructions for controlling a coherent electromagnetic radiation source applied to a top surface of the at least one layer to heat the at least one metal layer sufficiently to remove gallium from the layer, as required by claim 1.

Hongo II specifically teaches use of computer 200; and a focused ion beam, or alternatively, using a laser beam (see Hongo II, Figure 20, column 3, lines 5-8, and lines 18-23; and column 16, lines 19-29). However, the Patent Office has not identified and Applicants are unable to find in the teaching or suggestion in Hongo II of a system having a controller configured to control the introduction of a focused ion beam to form at least one metal layer over a substrate, and instructions for controlling a coherent electromagnetic radiation source applied to a top surface of the at least one layer to heat the at least one metal layer sufficiently to remove gallium from the layer, as required by claim 1. Specifically, Hongo II teaches either using a laser in a chemical vapor deposition (CVD) or, in the alternative, using an ion beam in a CVD deposition. However, Hongo II does not teach an ion beam forming a layer and then a laser applied to a top surface of the layer formed by the ion beam.

In addition, Hamamura discloses computer 38 to control the controller group including ion beam controller 33, power source 34, stage controller 35, gas controller 36, detector and shutter controller 37 (See Hamamura, col. 6, col. 10, Figure 1). However, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in Hamamura that accounts for a system having a controller configured to control the introduction of a focused ion beam to form at least one metal layer over a substrate, and instructions for controlling a coherent electromagnetic radiation source applied to a top surface of the at least one layer to heat the at least one metal layer sufficiently to remove gallium from the layer, as required by claim 1.

Hence, for at least the first reason that neither Hongo I, Hongo II, Hamamura, nor the combination teach the limitation noted above of claim 1, Applicants respectfully request that the Patent Office withdraw the rejection above of claim 1.

Applicants submit that dependent claims 2-9 and 11-14 being dependent upon allowable base claim 1, are patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 2-9 and 11-14 as being unpatentable over the cited references.

Applicants respectfully disagree with the rejection above and submit that independent claim 15, is patentable over the cited references for at least the reason that the cited references do not teach or suggest a system having a controller configured to control the introduction of a focused ion beam to form at least one metal layer over a substrate, and instructions for controlling one of a continuous wave laser, and a pulsed laser applied to a top surface of the at least one layer to heat the at least one layer, as required by claim 15.

An argument analogous to the one above for claim 1 and Hongo I, Hongo II, and Hamamura applies here as well. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above of claim 15.

Applicants submit that dependent claims 16-17 being dependent upon allowable base claim 15, are patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 16-17 as being unpatentable over the cited references.

Applicants respectfully disagree with the rejection above and submit that independent claim 18, is patentable over the cited references for at least the reason that the cited references do not teach or suggest a system having a controller configured to control the introduction of a focused ion beam to form at least one metal line over a substrate, and instructions for controlling a coherent electromagnetic radiation source applied to a top surface of the at least one line to heat the at least one line, as required by claim 18.

An argument analogous to the one above for claim 1 and Hongo I, Hongo II, and Hamamura applies here as well. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above of claim 18.

Applicants submit that dependent claims 19-21 being dependent upon allowable base claim 18, are patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 19-21 as being unpatentable over the cited references.

Next, the Patent Office rejects claims 12 and 15-21 under 35 U.S.C. § 103 as being unpatentable over U.S. Patent no. 5,026,664 to Hongo et al. (Hongo I) taken in view of U.S. Patent no 5,182,231 to Hongo et al. (Hongo II) and U.S. Patent no. 5,342,448 to Hamamura (Hamamura) and further in view of U.S. Patent no 5,683,547 to Azuma et al. (Azuma).

Applicants submit that dependent claim 12 being dependent upon allowable base claim 1, is patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claim 12 as being unpatentable over the cited references.

Applicants respectfully disagree with the rejection above and submit that independent claim 15, is patentable over the cited references for at least the reason that the cited references do not teach or suggest a system having a controller configured to control the introduction of a focused ion beam to form at least one metal layer over a substrate, and instructions for controlling one of a continuous wave laser, and a pulsed laser applied to a top surface of the at least one layer to heat the at least one layer, as required by claim 15.

An argument analogous to the one above for claim 1 and Hongo I, Hongo II, and Hamamura applies here as well.

Further, Azuma teaches an apparatus used as shown in FIG. 25f for irradiating a laser beam 240 in a CVD gas atmosphere through a known laser CVD method to form CVD wiring 241, whereby the CVD wiring 241 can be led out of the lower wiring layer without shortcircuiting the upper wiring layer.

However, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in Azuma that accounts for a system having a controller configured to control the introduction of a focused ion beam to form at least one metal layer over a substrate, and instructions for controlling one of a continuous wave laser,

and a pulsed laser applied to a top surface of the at least one layer to heat the at least one layer, as required by claim 15.

Hence, for at least the first reason that neither Hongo I, Hongo II, Hamamura, Azuma, nor the combination teach the limitation noted above of amended claim 15, Applicants respectfully request that the Patent Office withdraw the rejection above of claim 15.

Applicants submit that dependent claims 16-17 being dependent upon allowable base claim 15, are patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 16-17 as being unpatentable over the cited references.

Applicants respectfully disagree with the rejection above and submit that independent claim 18, is patentable over the cited references for at least the reason that the cited references do not teach or suggest a system having a controller configured to control the introduction of a focused ion beam to form at least one metal line over a substrate, and instructions for controlling a coherent electromagnetic radiation source applied to a top surface of the at least one line to heat the at least one line, as required by claim 18.

An argument analogous to the one above for claim 15 and Hongo I, Hongo II, Hamamura, and Azuma applies here as well. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above of claim 18.

Applicants submit that dependent claims 19-21 being dependent upon allowable base claim 18, are patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 19-21 as being unpatentable over the cited references.

Next, the Patent Office rejects claims 16 and 18-21 under 35 U.S.C. § 103 as being unpatentable over U.S. Patent no. 5,026,664 to Hongo et al. (Hongo I) taken in view of

U.S. Patent no 5,182,231 to Hongo et al. (Hongo II) and U.S. Patent no. 5,342,448 to Hamamura (Hamamura) and further in view of U.S. Patent no 5,683,547 to Azuma et al. (Azuma) and further in view of U.S. Patent no 6,261,850 to Marsh et al. (Marsh).

Applicants submit that dependent claim 16 being dependent upon allowable base claim 15, is patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claim 16 as being unpatentable over the cited references.

Applicants respectfully disagree with the rejection above and submit that independent claim 18, is patentable over the cited references for at least the reason that the cited references do not teach or suggest a system having a controller configured to control the introduction of a focused ion beam to form at least one metal line over a substrate, and instructions for controlling a coherent electromagnetic radiation source applied to a top surface of the at least one line to heat the at least one line, as required by claim 18.

An argument analogous to the one above for claim 1 and Hongo I, Hongo II, Hamamura, and Azuma applies here as well.

Further, Marsh teaches beam source 12 may be a focused light beam source such as a laser light source and suitable focusing optics (see col. 7, lines 11-22).

However, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in Marsh that accounts for a system having a controller configured to control the introduction of a focused ion beam to form at least one metal line over a substrate, and instructions for controlling a coherent electromagnetic radiation source applied to a top surface of the at least one line to heat the at least one line, as required by claim 18.

Hence, for at least the first reason that neither Hongo I, Hongo II, Hamamura, Azuma, Marsh, nor the combination teach the limitation noted above of amended claim 18, Applicants respectfully request that the Patent Office withdraw the rejection above of claim 18.

In addition, to the reasons above, Applicants respectfully disagree with the rejection above of independent claim 18, for at least the reason that the cited references do not teach or suggest a lens coupled to the coherent electromagnetic radiation source to focus the coherent electromagnetic radiation source to a spot size on the at least one line that conforms to the line width, as required by amended claim 18. Specifically, Applicants traverse the Patent Office's assertion that "it would have been obvious to one skilled in the art to use the commercially available Ga FIB CVD source of Marsh as the Ga FIB CVD source suggested by Hongo II, ...," in accordance with MPEP § 2144.03 and request that the Patent Office cite a reference in support of that position. Specifically, Applicants point out that heat source 191 of applicants' specification is a source in addition to FIB source 175. Hence, for at least this additional reason, Applicants respectfully request that the Patent Office withdraw the rejection above of claim 18.

Applicants submit that dependent claims 19-21 being dependent upon allowable base claim 18, are patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 19-21 as being unpatentable over the cited references.

In addition, to the reasons above, Applicants respectfully disagree with the rejection above of dependent claims 6 and 19, for at least the reason that the cited references do not teach or suggest a lens that comprises a 5x lens of numerical aperture approximately 0.15 to focus a spot size of the coherent electromagnetic radiation source in the range of 8 microns to 10 microns in diameter, as required by amended claim 18. Specifically, Applicants traverse the Patent Office's assertion that "the particular lens used is a results effective variable and a matter of obvious choice for one skilled in the art," in accordance with MPEP § 2144.03 and request that the Patent Office cite a reference in support of that position. Hence, for at least this additional reason, Applicants respectfully request that the Patent Office withdraw the rejection above of claims 6 and 19.

Finally, the Patent Office rejects claims 1-21 under 35 U.S.C. § 102(e) as anticipated by or, in the alternative, under 35 U.S.C. § 103 as being obvious over U.S. Patent No. 6,638,580 to Gavish (Gavish). Applicants amend the current Application to be a Continuation-In-Part claiming priority from Gavish under 37 C.F.R. § 1.78. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above as Gavish is not prior art to the current Application.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending (1) are in proper form, (2) are neither obvious nor anticipated by the relied upon art of record, and (3) are in condition for allowance. A Notice of Allowance is earnestly solicited at the earliest possible date. If the Examiner believes that a telephone conference would be useful in moving the application forward to allowance, the Examiner is encouraged to contact the undersigned at (310) 207-3800.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly, extension of time fees.

Respectfully submitted,

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Marilyn Bass

July 28, 2005